Our Ref: AM/JK/JN0877
Your Ref:

21st December 2016

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For the attention of Howard Dowell

Dear Sir,

Re: Phase II Investigation Preliminary Review for Upper New Street, Barnsley
National Grid Reference: SE 345 059
Geology: Pennine Middle Coal Measures (Coal outcropping on site)

1 Scope

This report presents a review of our preliminary Phase II Site investigation findings, exploratory hole logs and test results (to date) and our interpretation of these data.

As with any site there may be differences in soil conditions between exploratory hole positions.

This report is not an engineering design and the figures and calculations contained in the report should be used by the Engineer, taking note that variations will apply, according to variations in design loading, in techniques used, and in site conditions. Our figures therefore should not supersede the Engineer's design.

The findings and opinions conveyed via this Site Investigation Report are based on information obtained from a variety of sources as detailed within this report, and which Southern Testing Laboratories Ltd believes are reliable. Nevertheless, Southern Testing Laboratories Ltd cannot and does not guarantee the authenticity or reliability of the information it has obtained from others.

The site investigation was conducted and this report has been prepared for the sole internal use and reliance of Glanville Group. This report shall not be relied upon or transferred to any other parties without the express written authorization of Southern Testing Laboratories Ltd. If an unauthorised third party comes into possession of this report they rely on it at their peril and the authors owe them no duty of care and skill.

The recommendations contained in this report may not be appropriate to alternative development schemes. The contamination screening values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based on them. Their validity should be confirmed at the time of site development.

2 Site Description and Proposed construction

The site in Barnsley, South Yorkshire, which extends for approximately 0.5ha, currently comprises a former bingo hall with blacktop car park to the front. The site lies within the land bound by Upper New Street, Thomas Street, Burleigh Street and John Street.

It is proposed to develop the site with a new McDonalds Restaurant, as per the AEW feasibility site layout option 3, dated 20/06/16.

3 Geology

The site is shown on the 1:50,000 British Geological Survey map of the area (No.87 Barnsley) to be underlain by the Pennine Middle Coal Measures (PMCM) although, specifically, the Woolley Edge Rock, with two coal seams shown to be outcropping on site, namely the Meltonfield (Woodmoor, Wathwood) Coal centrally, and the Two-Foot (Royston, Half Yard) Coal, reflecting the westerly local slope. Deeper coal seams include the Abdy (Winter) Coal, Top Beamshaw (Kilnhurst) Coal, Low Beamshaw Coal.

Coal Seam	Thickness	Types of workings
Meltonfield	0.0-1.4m	Worked (opencast)
Two-Foot	0.1-2.1m	Minor Workings (mine, opencast)
Adby	0.0-1.9m	Worked (crop, mine, opencast)

Geology of the Barnsley District – a brief explanation of the geological map sheet 87 Barnsley, 2007.

3.1 BGS Archive Information

BGS Archives have records of a site investigation comprising 4 No. boreholes, to depth of between 15.5-22m bgl. The boreholes are dated 1989, and therefore appear to be associated with the development of the existing building, from the former garage usage.

Two boreholes logs describe the top 4m in detail, indicating 2.6-3.6m of made ground comprising clay with brick, sandstone, metal, coal and mudstone fragments. This is underlain by natural mudstones. The other boreholes suggest 3.3-4.8m of clayey overburden, which is potentially also made ground material. BH3 indicates the possible presence of workings at the base of the fill which could be the legacy of the Meltonfield Coal, mapped to outcrop on site.

Intact coal was reported in BH1 from 4.1-4.3m bgl; BH2, BH3 and BH4 all recorded 1.15-1.2m of intact coal from 8.0-10.4m, between 1.15-1.2m thick. The two deeper boreholes, BH1 and BH3, reported loose damp mudstone and coal from 20.2-21.4 in BH1 and 19.2-20.3m in BH3, suspected as being old mine workings (1.1-1.2m thick).

It is likely that the first seam is the Meltonfield Coal and the deeper underlying seam is the Two-Foot Coal, believed to have been worked locally – see section 8 below.

4 Site investigation Method

The strategy adopted for the intrusive investigation comprised the following:

- 7 No. window sampler trial holes drilled internally to a maximum depth of 3.0m bgl.
- The installation of 3No gas monitoring well and four subsequent monitoring visits (monitoring currently ongoing – the first two visits are summarised in section10).
- 5 No. test pits were excavated using a hydraulic backhoe excavator.

Exploratory hole locations are shown in Figure 1 in Appendix A.

Further Phase III Works, post demolition, are proposed and likely to comprise additional trial pitting below the former building footprint and 3 No. rotary boreholes to investigate the deeper coal mining legacy issues.

5 Soils as found

The soils encountered are described in detail on the attached exploratory hole logs (Appendix A). We have summarised the internal and external hole separately below.

5.1 External Trial Pits (TP's 1-5)

Depth	Thickness	Soil Type	Description
GL – 0.1/0.2m	0.1-0.2m	BLACKTOP	Blacktop car park.
- 0.6/1.25	0.5-1.05m	MADE GROUND	Variable layers of fill comprising: Moderately compact buff, silty sandy fine to coarse limestone (SUB-BASE). Loose to moderately compact dark grey, silty sandy gravel, including brick, concrete, clinker, mudstone, coal and sandstone. Loose sandstone boulders with a sandy matrix.
- 1.25/2.1	0.65-0.85m	CLAY	Firm to stiff, grey orange brown, mottled, silty CLAY, with some weak mudstone gravel.
- 2.9m+	1.65m+	MUDSTONE	Extremely weak, light grey orange-brown disused MUDSTONE, with sandy clay matrix, with occasional ferruginous concretions. Not encountered in the shallower TP5

5.2 Internal Window Sample Holes (WS1-7)

Depth	Thickness	Soil Type	Description
GL – 0.15/0.19m	0.15-0.19m	CONCRETE	Concrete floor slab with reinforcement.
- 0.25/0.5m	0.09-0.33m	MADE GROUND (SUBBASE)	Light grey/ buff, silty sandy GRAVEL. Gravels consist of fine to coarse, sub-angular limestone/ siltstone.
- 0.5/2.8m	0.25-2.5m	MADE GROUND	Brown, sandy gravelly CLAY, with brick, ash and concrete. *[Only identified in WS1 and WS4]*
- 0.8/3.0m+	0.5-2.2m+	CLAY	Stiff to hard, grey mottled orange-brown, silty CLAY, with weak lithorelict structure. No identified in WS4 and WS6
-2.8m+	1.5m+	MUDSTONE	Very weak, grey, thinly laminated MUDSTONE. Occasional ferruginous staining on mudstone faces. Not identified in WS2 and WS3

5.3 Visual and Olfactory Evidence of Contamination

Evidence of possible contamination was more notable and widespread within the external trial pits, largely noted as demolition rubble made ground comprising brick, concrete, clinker, sandstone cobbles and coal. Similar made ground was noted within the window sample holes, but only with WS and WS4.

5.4 Groundwater Strikes

Groundwater was not encountered within any of the trial holes.to a maximum depth of 3m.

6 Geotechnical Discussion

In general, less made ground was encountered in this investigation than reported for in BGS archive boreholes, drilled by others in 1989, although it did extend to 2.8m in WS4.

Based upon the proposals, it is understood that the eastern boundary, parts of the north and southern boundaries are to be retained following a reduce-dig exercise to level the site with the access from Upper New Street in the west. We understand that finished floor levels will be at around 112m, and the existing building slab lies at around 110.6-111.2m AOD on the ground/lower ground floor, and at 113.5m AOD on the upper ground floor.

On the basis of the fieldwork to date, therefore, a natural formation of stiff clays or weak grey mudstones is largely anticipated for the proposed building, although deeper made ground should be anticipated locally (such as around WS4). Coal was encountered (potentially intact natural) within WS2 and WS7, which largely coincides with the mapped Meltonfield Coal Seam, shown to outcrop across the site and believed to underlie site westward of the outcrop. Is was not noted within WS3 on the lower ground floor (slightly surprisingly, given proximity to WS2) or within WS4-WS6 on the upper ground floor, but this is possibly due to the difference in levels. Based on the reduce-dig required, it is likely that the coal will be removed from around WS7 during the earthworks, but potentially some may remain in-situ based upon the levels encountered at in WS2. As this seam is confirmed to outcrop on site and dip under the site (including the proposed building), a potential mining risk from this seam at shallow level persists (as a workable outcropping seam), together with the deeper Two-Foot Coal which is known to have been worked locally.

The table below details the levels in which the coal was encountered.

Hole ID	Thickness (m)	Top of coal m(AOD)	Base of Coal m(AOD)
WS2	0.5	110.29	109.79
WS7	0.7	113.22	112.52

The site lies within a Mineral Safeguarding Area (MSA). The Coal Authority is actively encouraging the need for prior extraction through responses to planning application where surface coal recourses are within the application site. We understand that this is implemented by the Local Authority and is within the Barnsley Core Strategy. Whether or not this is required will be dependent upon the local authority strategy, together with the volume and quality of the coal, which would be determined by the Phase III investigation.

Further works are proposed, post-demolition, comprising trial pitting to further investigate the shallow coal and three rotary boreholes to investigate the deeper coal risk. Depending upon the findings of the Phase III works, grouting of former workings may to be required.

6.1 Swelling & Shrinkage

Four Atterberg Limit tests were scheduled on representative samples of the underlying clays and mudstone recovered from varying depths. Two results are complete to date and have returned Plasticity Indices between 17-18%. It is anticipated that the one of the remaining samples will report a higher value, as such, at this stage NHBC Medium Volume Change Potential (VCP), should be adopted for design in terms of NHBC Chapter 4.2 guidelines for the design of new foundations/floor slabs – subject to final laboratory results.

7 Sulphates and Acidity

The water soluble sulphate concentration and soil pH have been analysed in six samples of the soils recovered, at various depths. The samples recorded pH values in the range of 5.3-8.3, slightly acidic to slightly alkaline. All samples reported a water soluble sulphate concentration of <500mg/l.

The appropriate Design Sulphate Class is therefore DS-1 and, given the absence of groundwater, the ACEC site classification is AC-1s.

Conditions at depth have not been proven to date and may be more onerous in terms of sulphate concentrations. This would need confirmation if, for example, a contiguous bored pile wall was under consideration.

7.1 Foundations

As discussed above, development is likely to mostly involve a 'cut' exercise (of around 1.5-2m) on the build print, but also include making up levels (again of approximately 1.5-2m) on certain parts of the western elevation, where it spans over the basement level. Such works may also be accentuated by local extra-dig requirements (old foundations, coal outcrop etc).

On the basis of the investigation to date, and anticipated mining risk, a raft or deepened beam foundation would be preferred, deepened through any remnant made ground (following the proposed reduce-dig), and placed upon the firm to stiff clays or weak mudstones. For low-medium VCP substrate, a minimum foundation depth of 0.9m applies (subject to final laboratory results). On these formations, an allowable bearing pressure of 125kN/m^2 may be considered. If coal persists at or near the formation level (potentially around the areas of WS2), foundations should be stepped to deepen through this material onto the underlying clays or mudstone. Depending upon the results of the rotary boreholes and trial pits, with regard to the mine workings, a grouting exercise may also be required.

Foundations through or intersecting shallow seams would require a permit from the Coal Authority. Should prior extraction of the coal be undertaken, then an incidental coal agreement would be required. If large scale extraction is undertaken, then this would require a review of the foundation solution, upon completion of any earthworks.

Defunct infrastructure (cellars, foundations and drains etc) will potentially affect groundworks, and nominal allowances should be made for associated over-break and delays etc. 'Pumps and wells' were indicated on old maps and, similarly, any such features encountered will need to be considered by the structural engineer, and decommissioned in line with Environment Agency guidelines – structural cover slab, inert backfill etc.

7.2 Floor slabs

Suspended slabs or sub-raft venting, with land gas design precautions, are also a likely consideration given the on-site workings and potential off-site land gas risk – subject to the results of the gas risk assessment (on-going). The removal of the clays, as part of the reduce-dig, will result in an element of heave, which should be addressed in design by way of additional slab reinforcement and consideration of proprietary compressible void formers.

7.3 Excavations & Retaining

The investigation to date suggests that the works may be largely 'dry' in terms of groundwater seepages / control issues. However, in the absence of more detailed investigation and long term monitoring, design should allow for the inclusion of wall drainage etc.

Statutory support will be required in all excavations where personnel must work. The mixed fill and very gravelly clay deposits may be prone to instability and unheralded collapse. Accordingly, great care should be taken when designing temporary and permanent support/propping systems. Safe batter angles for construction might therefore vary according to weather conditions.

Deep excavations are likely to encounter obstructions in the form of defunct in-ground concrete (sandstone boulders were common in the made ground) and natural stronger rock bands. Pneumatic breaking equipment may need to be employed for deep sewers or the ground level reduction exercise.

A substantial retaining structure is likely to be necessary around the eastern perimeter of the site, retaining the footpath and highway for John, Burleigh & Thomas Streets. Local Authority Highways engineers are likely to require consultation on this aspect. Cantilever flight auger or sheet pile retaining walls may not be viable given the possibility of encountering relatively shallow rockhead, once site levels have been reduced. Reinforced mass concrete retaining structures might be considered, as above, but similarly may also be subject to pre-drill & grout of coal workings. Crib-lock and gabion types, which anticipate limited movement, may not be suited.

The investigations to date suggest that, following ground level reductions, a natural competent bearing formation for the new wall may be present relatively near surface, and for which an ABP of 125kPa would be applicable, as above.

The following parameters are suggested for each of the soil types present:

Soil Type	Angle of Friction (ϕ')	Bulk Density (γ_b)	Cohesion (c')
Made Ground	28°	18kN/m^3	0
Clay	28°	19kN/m^3	0
Mudstone	30°	19kN/m^3	0

8 Environmental Results

There is no single methodology that covers all the various aspects of the assessment of potentially contaminated land and groundwater. Therefore, the analytical framework adopted for this investigation is made up of a number of procedures, which are outlined below. All of these are based on a Risk Assessment methodology centred on the identification and analysis of Source – Pathway – Receptor linkages.

The CLEA model[1] provides a methodology for quantitative assessment of the long term risks posed to human health by exposure to contaminated soils. Toxicological data is used to calculate a Soil Guideline Value (SGV) for an individual contaminant, based on the proposed site use; these represent minimal risk concentrations and may be used as screening values.

In the absence of any published SGVs for certain substances, Southern Testing have derived or adopted Tier 1 screening values for initial assessment of the soil, based on available current UK guidance including the LQM/CIEH[2] S4UL's and CL:AIRE[3] generic assessment criteria. In addition, in March 2014, DEFRA[4] published the results of a research programme to develop screening values to assist decision making under Part 2A of the Environmental Protection Act. Category 4 screening levels were published for 6 substances, with reference to human health risk only. This guidance includes revisions of the CLEA exposure parameters, presenting parameters for public open space land use scenarios, and also of the toxicological approach. The screening levels represent a low risk scenario, based on a 'Low Level of Toxicological Concern' rather than the 'Minimal Risk' of CLEA, and the analytical results of this investigation may be considered relative to these levels.

The values used are valid at the time of writing but may be subject to change and any such changes will have implications for the assessments based upon them. Their validity should be confirmed at the time of site development.

Site-specific assessments are undertaken wherever possible and/or applicable.

CLEA requires a statistical treatment of the test results to take into account the normal variations in concentration of potential contaminants in the soil and allow comparisons to be made with published guidance.

Ground gases are assessed in accordance with the guidance given in CIRIA report C665.

[1] Environment Agency Publication SC050021/SR3 'Updated technical background to the CLEA Model' (2009).
[2] The LQM/CIEH S4ULs for Human Health Risk Assessment. (2014).
[3] The EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment (2009).
[4] SP1010 Development of Category 4 Screening Levels foe Assessment of Land Affected by Contamination. DEFRA, 2014.

9 Site Investigation – Soil

The number of sample locations was limited and was partly targeted at potential sources of contamination and partly to provide general coverage. Access was restricted by the presence of the existing building.

The potential for contamination by heavy metals, PAHs, asbestos, petroleum hydrocarbons and VOCs was identified in the preliminary conceptual model and observations made on site and, therefore, the following tests were selected.

Test Suite	Number of Samples	Soil Tested
STC Suite 2	7	MADE GROUND/ NATURAL
STC Suite 3	6	MADE GROUND
VOCs	4	MADE GROUND
Asbestos Quantification	3	MADE GROUND
WAC	3	MADE GROUND/ NATURAL

The test results are presented in full in Appendix B. A summary and discussion of the significance of the results and identified contamination sources is given below.

9.1 General Contaminants

The results of the key contaminant tests have been analysed in accordance with the CLEA methodology. The samples have been grouped into two populations comprising MADE GROUND and NATURAL soils. For each parameter in each population the sample mean is calculated and compared to a Tier 1 screening value. If the sample mean exceeds the screening value, the soil may be regarded as contaminated and further assessment may be required. If neither the sample mean nor any single value exceeds the screening value, the soil may be regarded as not contaminated, though further confirmatory assessment may be required. Where any single parameter value exceeds the screening value but the sample mean does not, further statistical analysis may be applied to that parameter if the available data is suitable. Such analysis would include an assessment of the Normality of the distribution of the data, consideration of the presence of outliers, and the calculation of a UCL estimate of the mean.

Summary data is presented in the tables below and the laboratory analysis is included in Appendix B. The screening values and source notes are presented in Table 1 "Tier 1 Screening Values" at the front of Appendix B.

Soil Type: MADE GROUND

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Tier 1 Screening Value
Arsenic (As)	mg/kg	10	37-55	20	640
Cadmium (Cd)	mg/kg	10	<0.2-1.9	0.59	190
Total Chromium (Cr)	mg/kg	10	12-35	18	--
Hexavalent Chromium (CrVI)	mg/kg	10	<4	4.0	33
Lead (Pb)	mg/kg	10	15-270	93	2330
Mercury (Hg)	mg/kg	10	<0.3-1.3	0.45	29-330
Selenium (Se)	mg/kg	10	<1	1.0	12,000
Nickel (Ni)	mg/kg	10	14-35	22	980
Copper (Cu)	mg/kg	10	29-92	53	68,000

Zinc (Zn)	mg/kg	10	43-220	89	730,000
Benzo[a]pyrene	mg/kg	10	<0.1-8.0	1.4	36
Naphthalene	mg/kg	10	<0.05-0.94	0.23	77-430
Acidity (pH value)	Units	10	5.9-9.3	8.2	--
Soil Organic Matter	%	10	1.1-10	2.9	--

The made ground analysed from across the site was largely free from significant contamination, relative to the corresponding tier 1 screening values. Some elevated concentrations of certain contaminants were, however reported (BaP) which, although not significant in terms of end use, may influence waste classification.

Soil Type: NATURAL

Contaminants	Units	No of Samples Tested	Range	Sample Mean	Tier 1 Screening Value
Arsenic (As)	mg/kg	3	<1-3.6	1.9	640
Cadmium (Cd)	mg/kg	3	<0.2	0.2	190
Total Chromium (Cr)	mg/kg	3	10-22	18	--
Hexavalent Chromium (CrVI)	mg/kg	3	<4.0	4.0	33
Lead (Pb)	mg/kg	3	21-24	23	2330
Mercury (Hg)	mg/kg	3	<0.3	0.3	29-330
Selenium (Se)	mg/kg	3	<1.0	1.0	12,000
Nickel (Ni)	mg/kg	3	27-46	34	980
Copper (Cu)	mg/kg	3	32-45	38	68,000
Zinc (Zn)	mg/kg	3	32-79	54	730,000
Benzo[a]pyrene	mg/kg	3	<0.1	0.1	36
Naphthalene	mg/kg	3	<0.05	0.05	77-430
Acidity (pH value)	Units	3	5.3-8.2	7.1	--
Soil Organic Matter	%	3	0.6-6.3	2.6	--

The underlying natural ground analysed was free from significant contamination, relative to the corresponding tier 1 screening values. The concentrations reported reflect background concentrations

9.2 Asbestos

The samples analysed for the STC Suites were also screened for asbestos as part of the general contamination testing. Although none was observed during the sampling, asbestos was reported in three of the samples screened as Chrysotile Loose fibres. Quantification tests were undertaken on all samples that screened positive, with all results reporting levels of <0.001%. As such, the overall risk to human health is likely to be low, assuming that site operatives employ good health and safety practices and some remediation is carried out in any soft landscaped areas.

It should be noted that some of the exploratory holes are discrete in nature with limited investigation below the existing building. There is always the potential for pockets of asbestos or for asbestos containing materials to be present, which have not been detected in the sampling, particularly below the existing building footprint.

The buildings and immediate surroundings should be subject to an asbestos survey, with all ACMs removed from site to a suitably licensed tip.

9.3 Organic Contaminants

Although there was no significant evidence of fuel contamination observed in the boreholes, given the site history, petroleum hydrocarbons and VOCs were considered a potential on-site contaminant (and therefore included in the conceptual model).

As a precaution, six samples from around the site were analysed for petroleum hydrocarbons (with detailed aliphatic and aromatic splits) and four samples for VOCs. All samples retuned results were either below detection limit or well below the human health screening values and no specific remediation is necessary in this regard.

9.4 Waste Disposal

The results for the general suites, carried out on selected samples of made ground and natural material recovered, together with three WAC tests, are appended for information, and should be forwarded to the tips for classification prior to removal.

10 Site Investigation – Gas

The desk study identified a potential gas source, both on and off-site, with a variable depth of made ground anticipated on site and potential backfilled quarries locally. This type of sources are characterised as being of medium generation potential, after Wilson and Haines (2005)[5].

Three gas monitoring wells were installed over the footprint of the proposed building. Four rounds of gas monitoring are scheduled, but to date just two have been completed, with two scheduled in the coming weeks.

10.1 Monitoring Programme and Results

The sensitivity of the proposed development is rated as low and, therefore, 4 gas readings will be undertaken in total (CIRIA C665, Table 5.5). The results of the monitoring programme to date (2 visits) are summarised below.

Borehole Gas Monitoring Results Summary			
Monitoring Well	WS4	WS5	WS6
Response Zone/Stratum	MADE GROUND	NATURAL	NATURAL
Evidence of contamination	General fill	None	None
No. of monitoring events (to date)	2	2	2
Methane % range	<0.1	<0.1	<0.1
Carbon Dioxide % range	1.2-1.9	1.6-1.9	1.0-1.2
Oxygen % range	18.9-19.8	18.9-19.5	19.9-20.4
Flow rate l/hr range	<0.1-0.1	<0.1-0.1	<0.1
BH Pressure range mb	-0.8 to -0.73	-0.8 to -0.73	-0.8 to -0.73
Water level mbgl	2.92-2.9	1.8-1.74	2.33-2.19
Atmospheric pressure during monitoring mb	1004-1006	1004-1006	1004-1006

The two monitoring visits to date have been undertaken to date, over a small range of atmospheric pressure (1004-1006mb). Only limited levels of gas have been measured to date, with the maximum concentration recorded being 1.9% (carbon dioxide). In addition, only very limited flow has been recorded, with a maximum of 0.1 l/hr.

[5] Wilson, S and Haines, S. 2005. Site investigation and monitoring for ground gas assessment – back to basics. Land Contamination & Reclamation 13, 3, 211-222.

Groundwater has ranged between 1.74 and 2.9m below ground level in the monitoring visits to date.

10.2 Identified Gas Regime

The maximum flow rate measured of 0.1l/hr has been assumed and used in the calculation, along with the maximum carbon dioxide reading of 1.9%. This yields a gas screening value (GSV) of 0.0019 for the site. This corresponds to Characteristic Situation 1 of the modified Wilson and Card classification, something that is supported by the low levels of gas recorded.

On the basis of these readings, no gas protection measures are required in the new build. This will be updated once the monitoring is complete.

11 Summary of Chemical Results

On the basis of the investigation to date, and relative to the proposed end-use, limited amounts of contamination has been identified – low concentrations of asbestos in places. The instigation was limited by the presence of the existing building and therefore there remains the potential for more significant contamination to be present under the existing building (particularly asbestos under the slab). However, on the basis of the results to date, no large scale remediation is required for the site. Any proposed landscaped areas will require sufficient topsoil and subsoil, mainly to provide a suitable growing medium, but also to mitigate any minor risk to the end-users.

We trust we have understood your requirements and would be pleased to discuss the above further, if required.

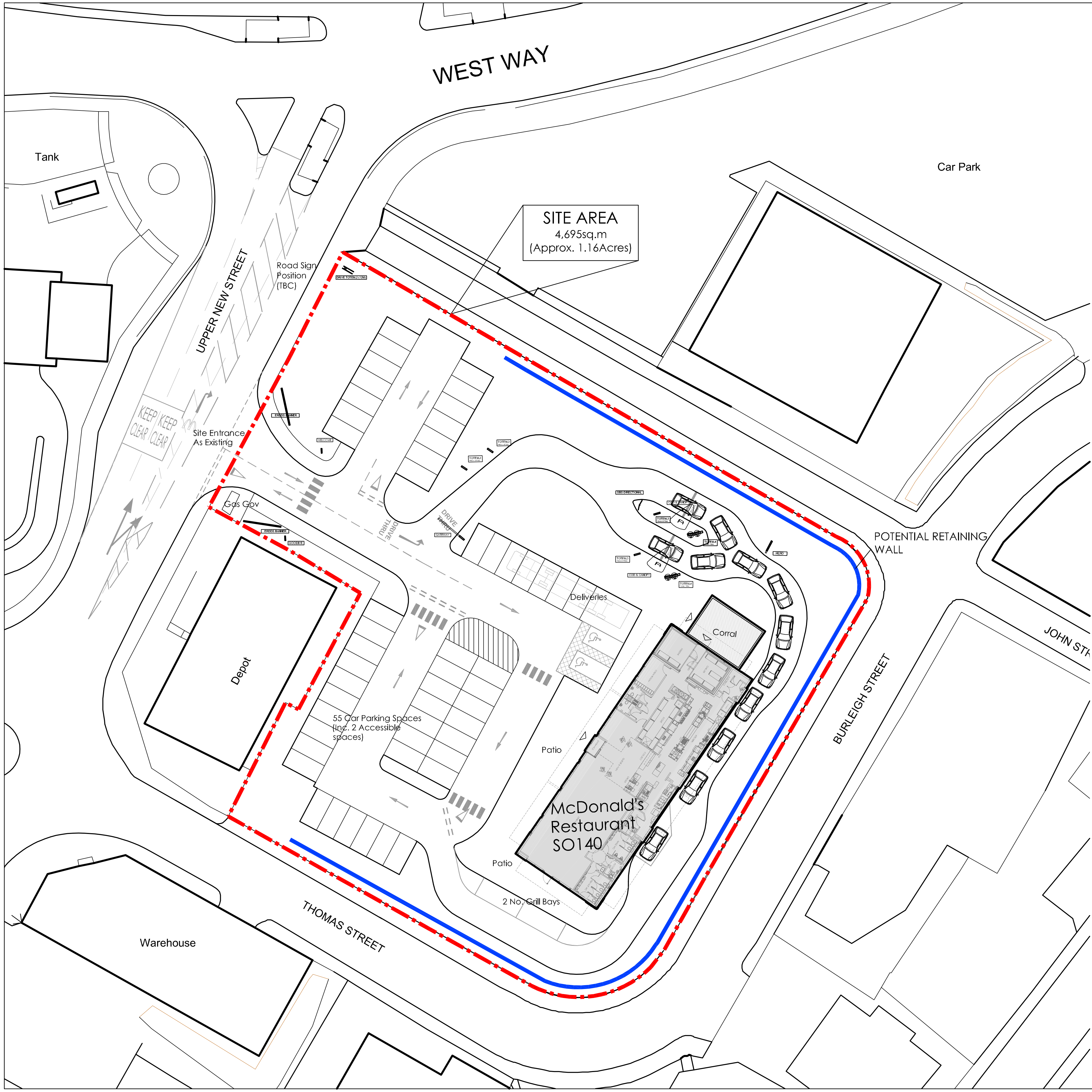
Yours faithfully,

Andrew Moffatt BSc MSc FGS
For and on behalf of
Southern Testing Laboratories Limited
DDI: 01604-500024
Email: amoffatt@stconsult.co.uk

APPENDIX A: Site Plan and Trial Hole Logs
APPENDIX B: Geotechnical Laboratory Results
APPENDIX C: Chemical laboratory Results
APPENDIX D: Gas Monitoring Results

APPENDIX A

Site Plans and Trial Hole Logs



Schedule of Areas (SO140):	sq.m
Site Area	tbc
Demise Area	4,695
Gross external area	444.1
Gross internal building area only (excludes freezer / chiller)	374.8
Corral Area	50
Approx. DT Area	653
Approx Car Park Area	1597
Approx Paved Areas	637
Site Layout Notes:	
Building Type	SO140
Distance between Booths	13825mm
DT Type	SBS
Transit or Family Saloon	Transit
COD position	Cars 10
No. Vehicles before COD	~7
Is local car parking available	NO

PROPOSED CAR PARKING SCHEDULE :

Grill Bays	=	2 Bays
Accessible	=	2 Spaces
General	=	51 Spaces
TOTAL	=	55 Spaces

TRANSIT SIDE BY SIDE SHOWN
(COD's at Cars 10)

FAST FORWARD SHOWN

0 5 10 15 20 25m
Scale 1:500

NOTES

- All dimensions and levels are to be checked on site.
- Any discrepancies are to be reported to the architect before any work commences.
- This drawing shall not be scaled to ascertain any dimensions. Work to figured dims only.
- This drawing shall not be reproduced without express written permission from AEW.
- Title overlay drawings and ownership boundaries are produced using all reasonable endeavours. AEW cannot be responsible for the accuracy or scale discrepancy of base plans supplied to them.
- All works are to be undertaken in accordance with Building Regulations and the latest British Standards.
- All proprietary materials and products are to be used strictly in accordance with the manufacturers recommendations.

NOTES:

Drawing based on OS Map. Full digital topographical survey required for accuracy.

Site boundary location subject to confirmation.

Layout based on desktop study of the site only, site visit required.

Layout subject to confirmation of swept path analysis by Highways Engineer for large family saloon for drive thru lane and 16.5m HGV for deliveries.

Layout based on McDonald's standard SO140 building footprint.

N

A	20/06/16	EG	JC
Updated to ADL Tracking. Refer to drawing no. 3210-SK-04.			
REV	Date	Drawn by: -	Checked by: -

Status: **S2** Purpose of Issue: **For Information**

drawing stage: **FEASIBILITY**

client: McDonald's Restaurants Ltd

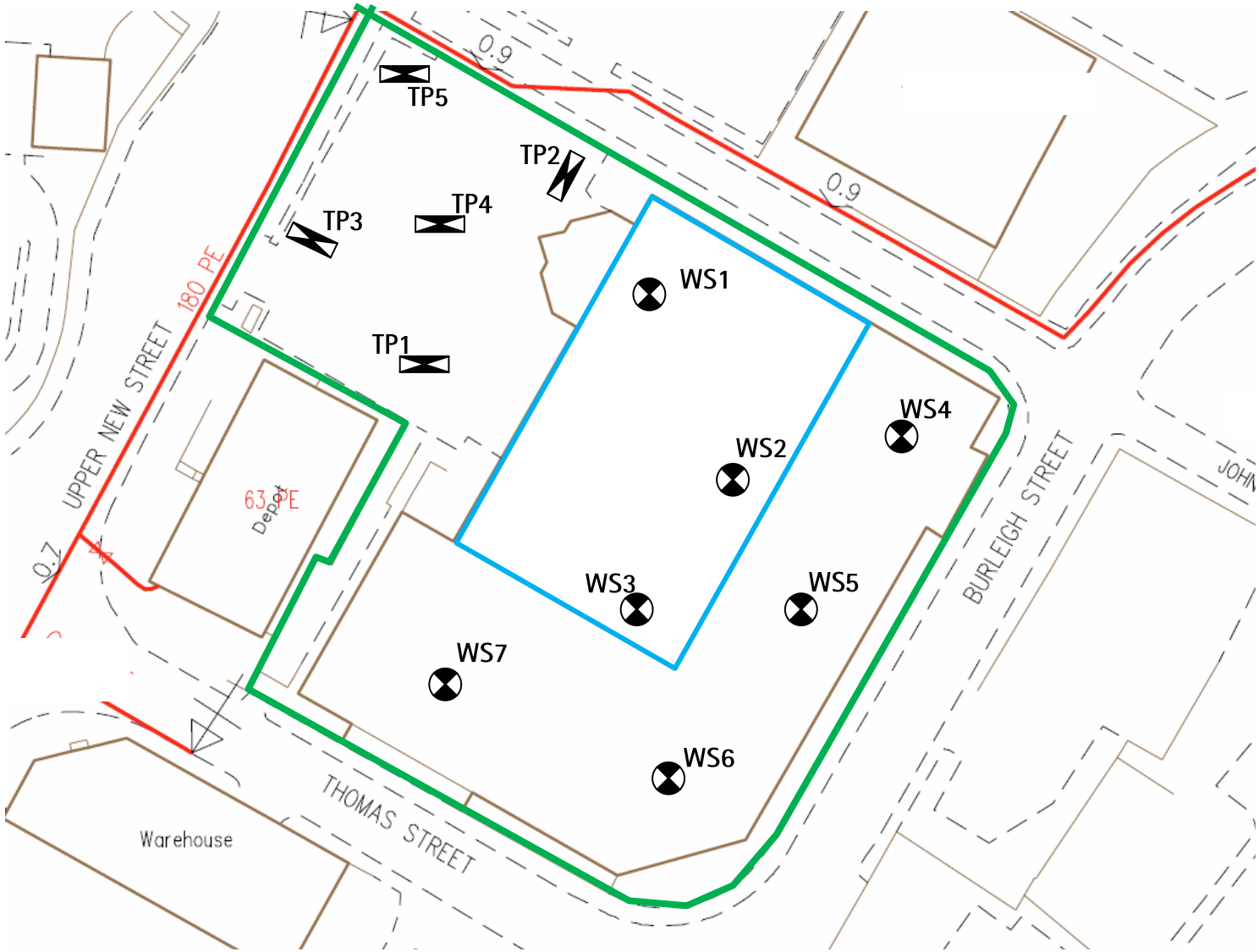
project: Barnsley Upper New Street — store: TBC

drawing title: **FEASIBILITY SITE LAYOUT OPTION 3**

date: 31/05/16 drawn: EG
scale@A3: 1:500 checked: JC

A E W ARCHITECTS AND DESIGNERS LTD
THE ZENITH BUILDING, SPRING GARDENS
MANCHESTER M2 1AB T:0161 2144370 F:0161 2144371

Job No **6635_AEW_XXXX_F003** Rev **A**



NB: Positions of Boreholes and/or Trial Pits are only indicative unless dimensioned – subject to services and access.

Site: Upper New Street, Barnsley	STL: JN0877	Fig No: 1
Date: 19 December 2016	Fieldwork location plan.	

Southern Testing

Southern Testing: Keeble House, Stuart Way, East Grinstead, West Sussex RH19 4QA
ST Consult: Twigden Barns, Brixworth Road, Creaton, Northampton NN6 8NN

ST Consult

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Tel: 01342 333100

Project No.	Machine Type	Trialpit No
JN0877	**JCB**	**TP1** Sheet 1 of 1

Project Name: Barnsley

NGR: -

Level: -

Date: 30/11/2016

Location: Barnsley

Dimensions: - Depth 2.90m

Client: Glanville

Logged By CN

Samples & In Situ Testing			Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
Depth (m)	Type	Results					
				0.10		0.10	ASPHALT
				0.30		0.40	MADE GROUND - Moderately compact buff silty sandy fine to coarse limestone gravel MOT.
0.50	ES			0.20		0.60	Possible MADE GROUND - stiff buff and black mottled silty sandy gravelly CLAY including mudstone and coal.
0.90		UCS = 190.0		0.65		1.25	Stiff buff orange brown mottled silty gravelly CLAY including mudstone.
0.90	D						
				1.65		2.90	Extremely weak subhorizontal fissile buff light grey MUDSTONE recovered as flaggy gravels and cobbles with ferruginous surfaces. Occasional sitstone bands and small boulder sized recovery.
2.90	D					2.90	Trial Pit Complete at 2.90 m

1

2

Remarks:

Pit Stability: Spall

Groundwater: Dry

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Project No.	Machine Type	Trialpit No
JN0877	**JCB**	**TP2** Sheet 1 of 1

Project Name: Barnsley
NGR: -
Level: -
Date: 30/11/2016

Location: Barnsley
Dimensions: -
Depth 2.85m

Client: Glanville
Logged By CN

Samples & In Situ Testing			Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
Depth (m)	Type	Results					
				0.20		0.20	ASPHALT
0.30	ES			0.15		0.35	MADE GROUND - Moderately compact buff slightly silty sand and limestone gravel MOT.
				0.45		0.80	MADE GROUND - Dark grey sand and fine to coarse gravel including clinker sandstone and brick.
				0.45		1.25	MADE GROUND - Sandstone boulders.
1.60							Firm to stiff buff light grey mottled silty slightly fine sandy CLAY with occasional mudstone and coal.
1.60	D	UCS = 210.0		0.85			1.65m: No coal fragments.
				0.75		2.10	Extremely weak light grey orange brown fissured MUDSTONE with sandy clay matrix. Recovered as flaggy gravels and cobbles. Occasional siltstone bands.
2.85	D					2.85	Trial Pit Complete at 2.85 m

1
2

Remarks:

Pit Stability: Spall

Groundwater: Dry

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Tel: 01342 333100

Project No.	Machine Type	Trialpit No
JN0877	**JCB**	**TP3** Sheet 1 of 1

Project Name: Barnsley

NGR: -

Level: -

Date: 30/11/2016

Location: Barnsley

Dimensions: - Depth 2.90m

Client: Glanville

Logged By CN

Samples & In Situ Testing			Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
Depth (m)	Type	Results					
				0.10		0.10	ASPHALT
				0.20		0.30	MADE GROUND - Moderately compact buff silty sandy fine to coarse limestone gravel.
				0.10		0.40	CONCRETE
0.45	ES			0.15		0.55	MADE GROUND - Loose dark brown grey silty fine to coarse gravel and cobbles, including clinker, brick and sandstone.
				0.40		0.95	MADE GROUND - Loose sandstone boulders with sandy matrix.
1.20 1.20	D	UCS = 300.0		0.65		1.60	Firm to stiff grey orange brown mottled silty CLAY with some weak mudstone gravel.
				1.30		2.90	Extremely weak blue grey MUDSTONE with occasional ferruginous concretions.
2.90	D					2.90	Trial Pit Complete at 2.90 m

1

2

Remarks:

Pit Stability: Spall

Groundwater: Dry

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Tel: 01342 333100

Project No.	Machine Type	Trialpit No
JN0877	**JCB**	**TP4** Sheet 1 of 1

Project Name: Barnsley

NGR: -

Level: -

Date: 30/11/2016

Location: Barnsley

Dimensions: - Depth 2.70m

Client: Glanville

Logged By CN

Samples & In Situ Testing			Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
Depth (m)	Type	Results					
				0.10		0.10	ASPHALT
				0.10		0.20	MADE GROUND - Sharp Sand
				0.10		0.30	CONCRETE - Reinforced.
				0.10		0.40	MADE GROUND - Moderately compact buff silty sand and limestone gravel. MOT.
				0.15		0.55	MADE GROUND - Leanmix.
0.60	ES			0.20		0.75	MADE GROUND - Loose to moderately compact dark grey silty sandy gravel including brick concrete and clinker fragments.
				0.15		0.90	MADE GROUND - Loose cobbles of brick and sandstone.
0.95	ES			0.10		1.00	MADE GROUND - Dark grey ash, metal and slate.
				0.15		1.15	MADE GROUND - Loose sandstone boulders.
1.30		UCS = 270.0					Firm to stiff orange brown light grey mottled silty fine sandy CLAY with mudstone gravel.
1.30	D			0.55		1.70	Extremely weak subhorizontal light grey orange brown mottled MUDSTONE recovered as flaggy gravels and cobbles. Occasional siltstone / fine sandstone bands.
				1.00			
2.70	D					2.70	Trial Pit Complete at 2.70 m

1

2

Remarks:

Pit Stability: Spall

Groundwater: Dry

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Tel: 01342 333100

Project No.	Machine Type	Trialpit No
JN0877	**JCB**	**TP5** Sheet 1 of 1

Project Name: Barnsley

NGR: -

Level: -

Date: 30/11/2016

Location: Barnsley

Dimensions: - Depth 1.30m

Client: Glanville

Logged By CN

Samples & In Situ Testing			Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
Depth (m)	Type	Results					
				0.10		0.10	ASPHALT
				0.20		0.30	CONCRETE - leanmix.
0.50	ES			0.40		0.70	MADE GROUND - Loose to moderatley compact dark grey ashy clinker gravel. 0.50m - 1.30m: Mass concrete foundation in east.
				0.20		0.90	MADE GROUND - Loose sandstone boulders.
1.30		UCS = 190.0		0.40		1.30	Firm to stiff orange brown and light grey friable silty CLAY with occasional coal fragments.
1.30	D						Trial Pit Complete at 1.30 m

1

2

Remarks: Mass concrete footing in east - premature termination.

Pit Stability: Spall

Groundwater: Dry

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Tel: 01342 333100

Project No.	Hole Type	Borehole No
JN0877	**WS**	**WS1** Sheet 1 of 1

Project Name: Barnsley

Dates: 30/11/2016

Location: Barnsley

NGR: -

Client: Glanville

Level: -

Logged By: ADM

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
						0.16		0.16	CONCRETE floor slab - 8mm reinforcement 125mm from top.
						0.09		0.25	Light grey/ buff, sandy gravel - possible lean mix below slab (MADE GROUND).
		0.45	ES			0.25		0.50	Dark brown, sandy, gravelly CLAY. Gravels consist of fine to coarse, angular siltstone, with brick and ash (MADE GROUND).
									End of Borehole at 0.50 m

1.0

2.0

		Type	Results

Hole Diameters

Depth (m)	Hole (mm)	Casing (mm)

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)

General Remarks:

Borehole refused at 0.5m bgl.

PT = Equivilant Standard Penetration Test , UCS = Unconfined Compressive Strength (kN/m2) by Hand Penetrometer , HV = Hand Vane Result (kPa)

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Tel: 01342 333100

Project No.	Hole Type	Borehole No
JN0877	**WS**	**WS2** Sheet 1 of 1

Project Name: Barnsley

Dates: 30/11/2016

Location: Barnsley

NGR: -

Client: Glanville

Level: -

Logged By: ADM

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
						0.17			CONCRETE floor slab - 8mm reinforcement 80mm and 100mm from top of core.
								0.17	
						0.13			Light orange/ buff, sandy GRAVEL .Gravel consists of medium to coarse, micaceous limestone - subbase (MADE GROUND).
								0.30	
									COAL - possibly intact natural.
		0.50	D			0.50			
		0.80		UCS = 400				0.80	
		0.90		UCS = 220					Stiff, grey, slightly silty CLAY - occasional leaf fossils.
		1.00	D						
						2.20			
		2.00		UCS = 400					
		2.50	D						
								3.00	End of Borehole at 3.00 m

	Type	Results

Hole Diameters

Depth (m)	Hole (mm)	Casing (mm)

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)

General Remarks:

PT = Equivilant Standard Penetration Test , UCS = Unconfined Compressive Strength (kN/m2) by Hand Penetrometer , HV = Hand Vane Result (kPa)

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Tel: 01342 333100

Project No.	Hole Type	Borehole No
JN0877	**WS**	**WS3**
		Sheet 1 of 1

Project Name: Barnsley

Dates: 30/11/2016

Location: Barnsley

NGR: -

Client: Glanville

Level: -

Logged By: ADM

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
						0.17		0.17	CONCRETE floor slab - 8mm reinforcement 125mm from top of core.
						0.33		0.50	Buff/ light orange, sandy GRAVEL. Gravel consist of fine to corse, subangualr limestone - subbase (MADE GROUND).
		0.90	D			1.50			Stiff to hard, grey mottled orange-brown, silty CLAY, with weak lithorelict structure from 1.0m.
		1.80	D						
		2.00		UCS = 400				2.00	End of Borehole at 2.00 m

1.0

2.0

		Type	Results

Hole Diameters

Depth (m)	Hole (mm)	Casing (mm)

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)

General Remarks:

Borehole terminated at 2.0m hard clays/ mudstones.

PT = Equivilant Standard Penetration Test , UCS = Unconfined Compressive Strength (kN/m2) by Hand Penetrometer , HV = Hand Vane Result (kPa)

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Project No.	Hole Type	Borehole No
JN0877	**WS**	**WS4** Sheet 1 of 1

Project Name: Barnsley

Dates: 30/11/2016

Location: Barnsley

NGR: -

Client: Glanville

Level: -

Logged By: ADM

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
						0.18			CONCRETE floor slab - 8mm reinforcement at 80mm from top of core.
						0.13		0.18	Buff/ light orange-brown, silty sandy GRAVEL. Gravel consists of fine to coarse, subangular, limestone/ siltstone - subbase (MADE GROUND).
		0.70	ES					0.30	MADE GROUND composed of brown, slightly sandy CLAY, with brick, ash and concrete fragments.
		1.50	ES			2.50			
						0.20		2.80	Hard, grey silty CLAY/ weak thinly laminated MUDSTONE.
								3.00	End of Borehole at 3.00 m

1.0

2.0

	Type	Results

Hole Diameters

Depth (m)	Hole (mm)	Casing (mm)

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)

General Remarks:

38mm gas monitoring well installed to 3.0m

PT = Equivilant Standard Penetration Test , UCS = Unconfined Compressive Strength (kN/m2) by Hand Penetrometer , HV = Hand Vane Result (kPa)

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Tel: 01342 333100

Project No.	Hole Type	Borehole No
JN0877	**WS**	**WS5** Sheet 1 of 1

Project Name: Barnsley

Dates: 30/11/2016

Location: Barnsley

NGR: -

Client: Glanville

Level: -

Logged By: ADM

Well	Water Strikes	Samples & In Situ Testing: Depth (m)	Type	Results	Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
						0.15		0.15	CONCRETE floor slab - 8mm reinforcement 90mm from top of core.
						0.15		0.30	Buff/ light orange-brown, silty sandy GRAVEL. Gravel consists of medium to coarse, subangular limestone/ siltstone - subbase (MADE GROUND).
		0.60	D			0.50		0.80	Stiff to hard, grey, silty CLAY, with weak lithorelict structure.
		1.50	D			1.20		2.00	Grey, very weak, thinly laminated silty MUDSTONE. Ferrugenous staining on faces.
									End of Borehole at 2.00 m

1.0

2.0

	Type	Results

Hole Diameters

Depth (m)	Hole (mm)	Casing (mm)

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)

General Remarks:

Borehole terminated at 2.0m on weak mudstone.
38mm gas monitoring well installed to 2.0m.

PT = Equivilant Standard Penetration Test , UCS = Unconfined Compressive Strength (kN/m2) by Hand Penetrometer , HV = Hand Vane Result (kPa)

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Tel: 01342 333100

Project No.	Hole Type	Borehole No
JN0877	**WS**	**WS6** Sheet 1 of 1

Project Name: Barnsley

Dates: 30/11/2016

Location: Barnsley

NGR: -

Client: Glanville

Level: -

Logged By: ADM

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
						0.19		0.19	CONCRETE floor slab - 8mm reinforcement at 100mm & 150mm from top of core.
						0.06		0.25	Buff, silty sandy GRAVEL. Gravels consists of fine to coarse, subangular limestone/ siltstone - subbase (MADE GROUND).
		0.60	ES			0.55		0.80	MADE GROUND composed of grey/ brown silty, slightly gravelly CLAY, with occasional ash and coal fragements. Gravels consist of fine to medium, subangular mudstone, limestone and siltstone.
		1.10		UCS = 350					Dark grey, very weak, thinly laminated MUDSTONE.
		1.20	D			0.90		1.70	Dark grey, very weak, thinly laminated MUDSTONE. Ferrugenous staining on mudstone faces.
		2.00	D			0.60		2.30	End of Borehole at 2.30 m

Type	Results

Hole Diameters

Depth (m)	Hole (mm)	Casing (mm)

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)

General Remarks:

Borehole terminated at 2.3m on weak mudstone.
38mm gas monitoring well installed to 2.3m.

PT = Equivilant Standard Penetration Test , UCS = Unconfined Compressive Strength (kN/m2) by Hand Penetrometer , HV = Hand Vane Result (kPa)

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Tel: 01342 333100

Project No.	Hole Type	Borehole No
JN0877	**WS**	**WS7** Sheet 1 of 1

Project Name: Barnsley

Dates: 30/11/2016

Location: Barnsley

NGR: -

Client: Glanville

Level: -

Logged By: ADM

Well	Water Strikes	Samples & In Situ Testing Depth (m)	Type	Results	Level (m AOD)	Thickness	Legend	Depth (m)	Stratum Description
						0.18			CONCRETE floor slab.
						0.12		0.18	Buff/ light orange, slightly silty sandy GRAVEL. Gravel consists of fine to coarse, subangular limestone/ siltstone - subbase (MADE GROUND).
		0.60	D			0.70		0.30	COAL possibly intact natural.
		1.10		UCS = 350		0.30		1.00	Stiff, grey silty CLAY.
		1.50	D			0.70		1.30	Stiff, light grey/ buff, silty CLAY, with weak lithorelict structure.
		2.50	D			0.80		2.00	Grey, very weak, thinly laminated silty MUDSTONE, with ferrugenous staining on mudstone faces.
								2.80	End of Borehole at 2.80 m

		Type	Results

Hole Diameters

Depth (m)	Hole (mm)	Casing (mm)

Water Strikes

Date	Water (m)	Casing (m)	Time (mins)	Rose to (m)	Sealed (m)

General Remarks:

Borehole terminated at 2.8m on weak mudstone.

PT = Equivilant Standard Penetration Test , UCS = Unconfined Compressive Strength (kN/m2) by Hand Penetrometer , HV = Hand Vane Result (kPa)

Key to Exploratory Hole Logs

General

All soil & rock descriptions in general accordance with BS5930:1999+A2:2010, BS EN ISO 14688 & BS EN ISO 14689
The Geology Code only entered where positive identification of the sampled strata has been made

Sampling

ES	Environmental Sample (taken in appropriate sampling container)
D	Disturbed Sample
B	Bulk Sample
LB	Large Bulk for Earthworks testing
C	Core Sample
U	Undisturbed Sample (number of blows indicated in results column)
SPTLS	SPT Liner Sampler
P	Piston Sample
W	Water Sample

Insitu Tests

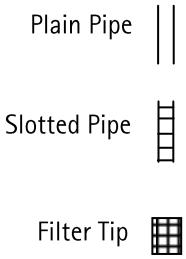
SPT	Standard Penetration Test in accordance with BS EN ISO 22476-3:2005+A1:2011
SPT (C)	Cone Penetration Test in accordance with BS EN ISO 22476-3:2005+A1:2011
PT	Penetration Test - STL documented equivalent SPT N Value
PPT	Perth Penetration Test - STL in house documented method (N Value)
UCS (⊥)	Unconfined Compressive Strength measure by hand penetrometer (kN/m^2)
IVN	Hand Vane (kPa)
PID	Photo Ionisation Detector Results (ppm)
MEXE	Mexecone CBR Result

Drilling Records

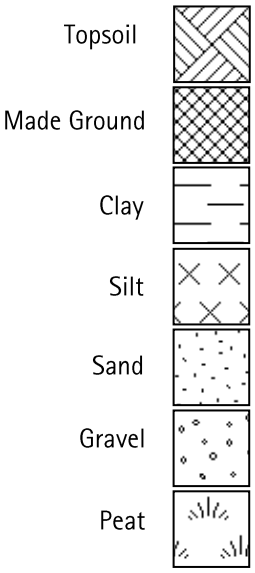
Depth to standing water level	▼
Depth to water strike	▽
TCR	Total Core Recovery (%)
SCR	Solid Core Recovery (%)
RQD	Rock Quality Index (%)
FI	Fracture Index

Backfill Symbols

Pipe Symbols



Principal Soil Types



Principal Rock Types